APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/703,909	11/01/2000	Todd P. Guay	1958.1031-000 (OID-1999-0	3199

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EXAMINER
SCHRANTZ, STEPHEN D

ART UNIT	PAPER NUMBER
2177	

DATE MAILED: 11/27/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 07-01)

Office Action Summary	Application No.	Applicant(s)
	09/703,909	GUAY ET AL.
	Examiner	Art Unit	
	Steve Schrantz	2177	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _01 November 2000_ .

2a)☐ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-54_ is/are pending in the application.

   4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-54_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

   Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

   If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   a)☐ All b)☐ Some * c)☐ None of:

   1.☐ Certified copies of the priority documents have been received.

   2.☐ Certified copies of the priority documents have been received in Application No. _____ .

   3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
      application from the International Bureau (PCT Rule 17.2(a)).
   * See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

   a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)	4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)	5) ☐ Notice of Informal Patent Application (PTO-152)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .	6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 103

1.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2.   Claims 1-6, 8-12, 18-30, 32, 34-38, and 44-54 are rejected under 35 U.S.C. 103(a) as

being unpatentable over Chaudhuri et al. (U.S. Patent 5,926,813, now referred to as Chaudhuri

(I)) further in view of Chaudhuri et al. (U.S. Patent 6,223,171, now referred to as Chaudhuri

(II)).

Chaudhuri (I) teaches independent claims 1 and 53-54 by the following:

"generating baseline statistics for each statement in the workload" at col. 6 lines 16-19;

"forming an index superset from a union of a current index set and a proposed index set" at col. 7

lines 56-63;

"deriving a candidate index set from the index superset, the candidate index being one of the

plurality of candidate index sets" at col. 8 line 65 to col. 9 line 2

"generating statistics based on the candidate index set and the baseline statistics" at col. 10 lines

22-25;

Chaudhuri (I) does not teach a user interface that presents the general statistics.

Chaudhuri (II) presents the statistics at Fig. 6-8 and Fig. 10-15. It would have been obvious to

one ordinarily skilled in the art at the time of the invention to present these statistics to the

administrator or user. By presenting the statistics, the user can gain a better understanding of the

costs and the advantages of particular indexes with each workload. Through this understanding,

the user can ensure that particular indexes will be used to improve the database access through

the statements of the workload.

Claims 53-54 refers to "repeatedly derives a candidate index set" which can be found at

Chaudhuri (I) col. 7 lines 46-56.

Chaudhuri (I) teaches dependent claim 2 by the following:

"generating current index statistics for the workload responsive to the current index set, the

presented generated statistics comprising the generated current index statistics" at col. 7 lines 46-

51.

Chaudhuri (I) teaches dependent claim 3 by the following:

"repeatedly deriving a candidate index set and generating statistics based on the proposed index

set" at col. 7 lines 46-56.

Chaudhuri (I) and Chaudhuri (II) teach dependent claim 4 by the following:

"terminating the repeated execution when at least one candidate index solution is found that

adheres to user-imposed constraints" at Chaudhuri (I) col. 6 lines 9-35 and the user imposed

constraints can be found at Chaudhuri (II) Fig. 4. The user is able to choose those indexes that

can be removed and those indexes will not degrade the performance found at col.11 line 66 to

col. 12 line 6;

"... no further indexes can be removed from said candidate index solution without degrading

performance of the workload" at Chaudhuri (I) col. 19 lines 48-58. Chaudhuri (I) teaches a

greedy algorithm that selects the indexes to be used to reduce the cost of the workload. If these

indexes will not reduce the cost, the index will not be added to the set. Chaudhuri (II) in Fig. 4

also demonstrates a user interface that allows an administrator to add and remove indexes in

order to achieve improved performance;

"... without disabling an integrity constraint" at Chaudhuri (I) col. 1 lines 52-55.

Chaudhuri (I) teaches dependent claim 5 by the following:

"wherein deriving the baseline statistics comprises disabling current indexes" at col. 14 lines 60-

65.

Chaudhuri (I) teaches dependent claims 6 and 32 by the following:

"creating an execution plan which represents a series of steps for executing the statement" at col.

10 lines 53-56;

"evaluating the execution plan" at col. 10 lines 57-60;

"generating and recording statistics based on the evaluation of the execution plan" at col. 10 lines

22-25.

Chaudhuri (I) teaches dependent claims 8 and 34 by the following:

"creating an execution plan is based on statistics for at least one schema object accessed by the

statement" at col. 10 lines 53-56 and col. 5 lines 52-56.

Chaudhuri (I) teaches dependent claims 9 and 35 by the following:

"the at least one schema object is a table" at col. 12 lines 20-29.

Chaudhuri (I) teaches dependent claims 10 and 36 by the following:

"the at least one schema object is an index" at col. 10 lines 54-55.

Chaudhuri (I) teaches dependent claim 11 by the following:

"for a table accessed by a statement under evaluation, identifying at least one index that would be used to retrieve data from the table upon an execution of the statement" at col. 6 lines 9-13.

Chaudhuri (I) teaches dependent claims 12, 19, 38, and 45 by the following:

"determining a cost of the execution plan" at col. 10 lines 54-56.

Chaudhuri (I) teaches dependent claims 18 and 44 by the following:

"wherein the statistics include an index usage" at col. 10 lines 38-47 and col. 10 lines 53-56.

Chaudhuri (I) teaches dependent claims 20 and 46 by the following:

"wherein the statements are SQL statements" at col. 5 lines 40-41 and col. 5 lines 61-64.

Chaudhuri (I) teaches dependent claims 22 and 48 by the following:

"deriving a candidate index set is responsive to a predetermined maximum number of allowed indexes" at col. 13 lines 1-9.

Chaudhuri (II) teaches dependent claims 23 and 49 by the following:

"wherein deriving a candidate index set is responsive to available storage space" at col. 1 lines 24-34.

Chaudhuri (II) teaches dependent claims 24 and 50 by the following:

"the proposed index set is provided by a user" at col. 12 lines 1-10.

Chaudhuri (I) teaches dependent claims 26 and 52 by the following:

"an execution plan is created without creating indexes which are not in the current index set" at col. 7 lines 52-63.

Chaudhuri (I) teaches dependent claim 27 by the following:

"a workload evaluator which evaluates each statement within the workload" at col. 10 lines 22-25;

"an index solution evaluator which, responsive to the workload evaluator, evaluates each index

in a candidate index set with respect to the workload, the candidate index solution being one of

the plurality of candidate index sets" at col. 10 lines 16-18;

"a solution/rollup evaluator which, responsive to the index solution evaluator, evaluates the

candidate index solution" at col. 10 lines 38-47;

"a solution refiner which, responsive to the solution/rollup evaluator, generates at least one new

candidate index solution" at col. 2 lines 59-62.

Chaudhuri (II) teaches dependent claim 28 by the following:

"the solution refiner generates at least one new candidate index solution by eliminating at least

one index within the candidate index solution that does not adhere to user-imposed constraints"

at Fig. 4.

Chaudhuri (II) teaches dependent claim 29 by the following:

"wherein the constraint is a user-defined constraint" at col. 11 line 46 to col. 12 line 30. This

segment teaches that an administrator can define many aspects, which will be later used to

determine the proposed index. The administrator can set the workload, the index configuration,

and the configurations for the database system. The segment teaches many of the administrative

functions of the database allowed to the user. Later, the statistical information acquired from the

administrator's defined constraints (costs determined from the workload at col. 15 lines 18-26)

will limit the indexes (col. 15 lines 6-11 and col. 15 lines 58-63).

Chaudhuri (II) teaches dependent claim 30 by the following:

"the constraint is a memory-usage constraint" at col. 1 lines 24-34.

Chaudhuri (I) teaches dependent claim 37 by the following:

"wherein the workload evaluator, for a table accessed by a statement under evaluation, identifies at least one index which would be used to retrieve data from the table upon an execution of the statement" at col. 18 lines 40-48.

3.   Claims 7, 31, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chaudhuri (I) et al. (U.S. Patent 5,926,813) in view of Chaudhuri (II) as applied to claims above, and further in view of Jakobsson et al. (U.S. Patent 5,924,088).

As per claims 7 and 33, Chaudhuri (I) teaches that an execution plan is created at col. 10 lines 53-56. Chaudhuri (I) also teaches that the indexes are used in order to access the database at col. 3 lines 50-54. He does not teach that the "execution plan is based on available access paths". Jakobsson does teach the use of access paths at col. 4 lines 1-4. It would be obvious to one ordinarily skilled in the art at the time of the invention to base the execution plan on an access path. The costs of the statements of the workload can be calculated through the use of the access paths. Using these paths would allow for improved calculations of the costs of each statement.

4.   Claims 13-16, 39-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chaudhuri (I) (U.S. Patent 5,926,813) in view of Chaudhuri (II) as applied to claims above, and further in view of Eberhard et al. (U.S. Patent 6,003,022).

As per claims 13 and 39, Chaudhuri (I) describes an invention that selects an index that would work best for a workload as described above. Chaudhuri (I) also teaches that each query does have a particular cost associated with each particular index at col. 10 lines 14-19.

Chaudhuri (I) does not teach that the cost of the execution plan is derived from a resource. Eberhard does teach that the execution costs are derived from a resource at col. 3 lines 43-45. It would be obvious to on ordinarily skilled in the art at the time of the invention to derive the cost of the execution plan from a particular resource. By calculating the costs of the queries under a particular index, the invention would be capable of calculating how each candidate index can affect each statement in the workload. Deriving the cost of the execution plan from a resource use needed to execute the statement allows the system to know how each query will affect the system's performance. Considering the system's performance will allow a better cost to be derived for the indexing system.

Eberhard teaches dependent claims 14 and 40 by the following:

"the resource use includes CPU execution time" at col. 3 lines 43-44.

Eberhard teaches dependent claims 15 and 41 by the following:

"the resource use includes input/output access" at col. 3 lines 43-44.

Eberhard teaches dependent claims 16 and 42 by the following:

"the statistics include the number of executions of the statement" at col. 24 lines 51-55.

5.   Claims 17 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chaudhuri (I) in view of Chaudhuri (II) as applied to claims above, and further in view of Smith et al. (U.S. Patent 5,404,510).

Chaudhuri (I) in view of Chaudhuri (II) teaches a query optimizer which searches for the best index to evaluate a given workload. They do not teach that a user is capable of defining the importance of the statement. Smith does teach a user-defined importance of the statement at col.

7 lines 22-32. It would have been obvious to one ordinarily skilled in the art at the time of the

invention to allow a user to define the importance of the statements found in the workload. A

user could rank the importance of the queries in the workload. The ranking could then be used to

define an index that works best for the workload. The index would then be created in

consideration of the higher ranked statements.

6.   Claims 21 and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Chaudhuri (I) et al. (U.S. Patent 5,926,813) in view of Chaudhuri (II) as applied to claims above,

and further in view of Celis et al. (U.S. Patent 6,021,405).

Chaudhuri (I) (5,926,813) teaches the use of statistics to find the cost of statements using

a particular index. He does not teach that the workload is reduced into unique statements in

order to determine these costs. Celis teaches that the workload is reduced into unique statements

at col. 5 lines 37-44. It would be obvious to one ordinarily skilled in the art at the time of the

invention to generate the statistic using only unique statements. Celis's invention is a query

optimizer that is used to reduce the cost of each statement at col. 1 lines 26-31. By only

optimizing the unique statements, the optimizer will not be burdened by redundant statements.

The needless optimizations cost more processing time and ultimately increase the execution time

for the query at col. 1 lines 42-51.

Claims 25 and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Chaudhuri (I) in view of Chaudhuri (II) as applied to claims above, and further in view of Lomet

et al. ("The Microsoft Database Research Group").

Chaudhuri (I) teaches a rules based system that uses particular functions to find an index

configuration for a given workload at col. 5 line 57 to col. 6 line 13. He does not specifically

teach upon an expert system that chooses the index configuration. Lomet does teach an expert

system that chooses a proposed index at pg. 83. It would be obvious to one ordinarily skilled in

the art at the time of the invention to use an expert system. By using an expert system, the

administrator would not have to determine the most useful index set. The expert system could

use prior knowledge and the calculations found in Chaudhuri (I) to determine an index set.

Chaudhuri (I) teaches dependent claims 25 and 51 by the following:

"wherein the proposed index set is provided by an expert system" at col. 5 line 57 to col. 6 line

13.

7.   Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chaudhuri (I) in

view of Chaudhuri (II) in view of Jakobsson as applied to claims above, and further in view of

Siegel et al. ("A Method for Automatic Rule Derivation to Support Semantic Query

Optimization").

Jakobsson teaches dependent claim 31 by the following:

"the solution refiner generates at least one new candidate index solution by eliminating at least

one index on a small table under evaluation, and wherein the at least one index does not enforce

an integrity constraint" at col. 12 line 66 to col. 13 line 1. Jakobsson says that the cost of

searching a table is directly related with the size of the table. Jakobsson teaches that indexes can

be used on these smaller tables. Jakobsson also teaches the use of different indexes to use in the

index access path at col. 13 line 17-25 and Figs. 4-5. Neither Jakobsson nor Chaudhuri teach

that the indexes removed do not enforce an integrity constraint. Siegel does teach that indexes

can be a part of an integrity constraint at pg. 1. It would have been obvious to one ordinarily

skilled in the art at the time of the invention to not remove indexes that were a part of the

integrity constraint. These indexes are used to ensure the validity of the database at pg. 1. By

removing integrity constraints, the database would no longer be guaranteed contain valid

information. These constraints can also be used to decrease the retrieval time of a statement at

pg. 1.

Conclusion

8.   The prior art made of record in PTO-892 and not relied upon is considered pertinent to

applicant's disclosure.

9.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Steve Schrantz whose telephone number is (703) 305-7690. The

examiner can normally be reached on Mon-Fri. 8:15-4:45.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

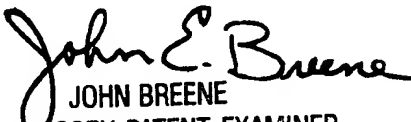supervisor, John Breene can be reached on (703) 305-9790. The fax phone numbers for the

organization where this application or proceeding is assigned are (703) 746-7239 for regular

communications and (703) 746-7238 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding

should be directed to the receptionist whose telephone number is (703) 305-3900.

SDS
November 22, 2002

JOHN BREENE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100